

Affordable Nano/Micro Launch Propulsion Stages

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Lead Center:MSFC

Participating Center(s):LaRC,KSC,GRC

As small satellites have become more capable of performing valuable missions for both government and commercial customers, there has been significant growth in both the quantity and quality of Nano and Micro Satellite missions. Currently these satellites can only be launched affordably as secondary payloads; but the number of these missions has outpaced available ride share opportunities. This limitation makes it difficult for small satellite missions to launch when needed and to attain the desired orbit with an acceptable risk.

A dedicated access to space also allows new and emerging technologies that increase capability and/or decrease costs to be demonstrated and qualified. Additive manufacturing is one example of such a technology. Technologies that are demonstrated and validated at the nano/micro scale can also be robustly infused into large launch vehicles where loads are not as severe.

Low cost, dedicated launch vehicles are required that will robustly meet the nano/micro satellite launch needs. This subtopic solicits technology proposals for propulsion stages of such a launcher. Specifically, the subtopic requests proposals for propulsion design tools and stages for application as booster stages, upper stages or orbit insertion stages. Stage concepts are sought that can be demonstrated within the schedule and budget of a Phase II STTR project with the following goals and constraints:

- Accepted proposals will be limited to stages that are applicable to existing or proposed architectures for orbital launch vehicles.
- A sub-orbital flight test is expected in Phase II. Additionally, the path from the sub-orbital flight test to orbital capability must be clearly defined.
- Demonstrations other than a sub-orbital flight test will be considered. However anything less than a sub-orbital flight test will require the documentation of the explicit path, including test plans and cost data, to an orbital-capable stage.
- Payload capabilities in the 5-50 kg range are targeted.
- Small launch vehicles are targeting total launch costs (fixed, reoccurring and range costs) in the \$1-2 million range. Proposed stages should demonstrate costs that fit within this range.

Phase I activities should develop the data necessary to assert with confidence that the proposed technology solution has a clear path to meet the goal an affordable orbital launch vehicle. Phase II activities will include sub-orbital stage flight-testing for verification of functionality as well as substantiation of cost projections for the orbital stage.